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USER MANUAL

Power supply for fire detection and fire alarm systems, smoke and heat control systems, and other fire protection systems

ZSP135-DR-2A-1, ZSP135-DR-3A-1, ZSP135-DR-3A-2,
ZSP135-DR-5A-1, ZSP135-DR-5A-2, ZSP135-DR-5A-3,
ZSP135-DR-7A-1, ZSP135-DR-7A-2, ZSP135-DR-7A-3

conforming to the standard EN 54-4:1997/A2:2006 and EN 12101-10:2005,
guidelines of VdS 2541:1996-12, 2882:2004-11, 2824:2004-03, 2593:2002-09
as well as to the Ordinance of the Polish Minister of Interior and Administration of
20.6.2007 (Dz.U. Nr 143, poz. 1002, amended on 27.04.2010),
in a casing of ingress protection IP44

17.01.2012

Certificate of conformity CNBOP No. 1438/CPD/0163

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Warnings

- **Before operation read this manual carefully**
- **Do not touch internal elements of the working device – danger of shock or burn**
- **Protect device against penetration of its interior by any object or liquid – danger of shock and damage of the device**
- **Do not cover ventilation holes – danger of damage of the device**
- **Ensure there is a free space of at least 10 cm at sides of the device to allow for proper ventilation**
- **It is forbidden to carry the device with mounted and connected batteries**
- **The device must be powered from the utility power grid with a protective earth terminal**
- **The device can interfere with sensitive radio or TV devices operating nearby**

1. Technical description

This user manual refers to the power supply with remote indication of faults defined as the mains fault and the battery fault. These two signals can be combined into a collective fault indication – see the section 2.3.

In this respect it differs from the previous version, offering the collective fault indication (including the mains fault too) and a separate signal about the mains fault.

Types of the available indications can be recognized by reading descriptions next to connectors or on the wiring diagram (a sticker inside the casing).

1.1. Application

The power supplies are dedicated to uninterruptible supply of power in the range of 55W to 190W at the voltage 24V to devices of fire detection and fire alarm systems, systems of smoke and heat control as well as other fire protection devices, where compliance with EN 54-4:1997/A2:2006 or EN 12101-10:2005, guidelines of VdS 2541:1996-12, 2882:2004-11, 2824:2004-03, 2593:2002-09 or the Polish Ordinance (specified on the title page) is required.

The battery back up power supplies ZSP135-DR supply power from the utility power grid or – in case of a power failure – from internal bank of VRLA batteries (known also as AGM or gel batteries). They have two outputs, protected by fuses. During a transition from the mains power to the battery power and vice versa there are no voltage dropouts on the outputs.

The power supplies fulfill the requirement of EN 54-4 to offer a collective fault indication by an appropriate connection of relay outputs of the signals (see the section 2.3).

The power supplies can manage an external binary fault signal and optionally can be equipped with the device to detect unauthorized opening of the door (see the section 4.3)

Type	Nominal output current I _{max a}	Maximal output current I _{max b}	Battery capacity	Type of the box
ZSP135-DR-2A-1	1.0A	2A	18Ah	A
ZSP135-DR-3A-1	2.0A	3A	18Ah	A
ZSP135-DR-3A-2	1.5A	3A	28Ah	B
ZSP135-DR-5A-1	4.0A	5A	18Ah	A
ZSP135-DR-5A-2	3.5A	5A	28Ah	B
ZSP135-DR-5A-3	3.0A	5A	40Ah	C
ZSP135-DR-7A-1	6.0A	7A	18Ah	A
ZSP135-DR-7A-2	5.5A	7A	28Ah	B
ZSP135-DR-7A-3	5.0A	7A	40Ah	C

Depending on the battery bank capacity the power supplies are assembled into three types of wall boxes.

Typ of the box	Dimensions
A	390 x 350 x 90
B	390 x 350 x 140
C	450 x 350 x 180

1.2. Technical data

General electrical and environmental parameters

Nominal input voltage	230V +10% -15%
Nominal output voltage *1)	27.1V
Output voltage range *2)	19.7...28.0V
Current consumption from the battery for own needs	max 35 mA
Maximal resistance of the battery circuit *3)	250mΩ
Number of cooperating batteries	2
Number of outputs protected by separate fuses	2
Working temperature *4)	-25...+55°C; 75°C over 2h
Ingress protection EN 60529:1991/A1:2000	IP 44
Functional class EN 12101-10:2005	A
Environment class EN 12101-10:2005	1
Environmental class VdS 2593	III
Electric safety class EN 60950-1:2006/A11:2009/A1:2010	I

*1) In floating mode at 25°C.

*2) The shown range is spanned between the voltage of a discharged battery bank (at the end of battery mode operation) and fast charging voltage.

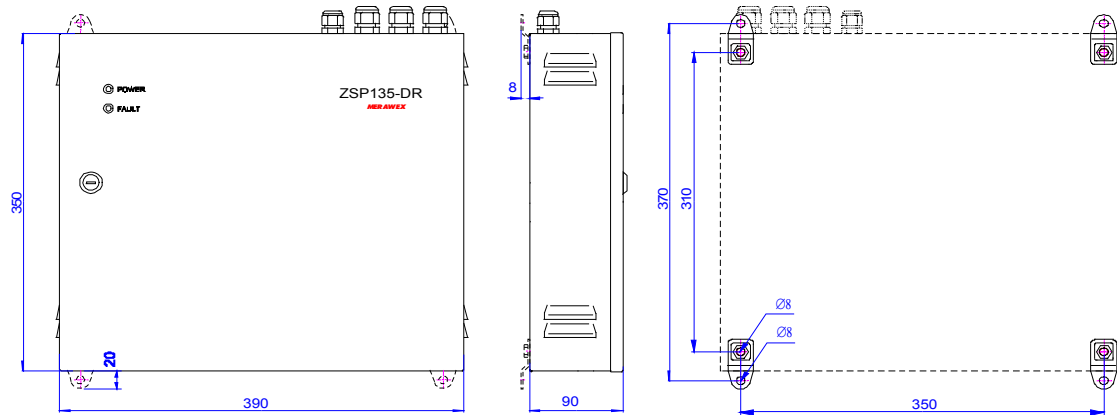
*3) The guaranteed value of the resistance of the battery circuit to trigger a fault indication.

*4) VdS tested temperature-dependent charging behavior in the range -5°C to +75°C. However, at high ambient temperatures an extremely short battery life time can be assumed. Therefore, ambient temperatures higher than 40°C should not prevail at the installation location.

Mechanical parameters

	Type of the box		
	A	B	C
Battery bank capacity	17Ah	28Ah	40Ah
Dimensions (W x H x D)	390 x 350 x 90	390 x 350 x 140	450 x 350 x 180
Mounting			
dimensions of the box interior (W x H)	350 x 310	350 x 310	410 x 310
dimensions with brackets (W x H)	350 x 370	350 x 370	410 x 370
Weight without battery bank	6.4kg	8.3kg	11.0kg
Weight with battery bank	18.0kg	28.3kg	42.3kg

*1) The battery of capacity 18Ah could be substituted by a battery of 17Ah.



Exemplary outer layout of the power supply (ZSP135-DR-5A-1) and location of the mounting holes.

The detailed technical description of the power supply ZSP135-DR could be found in the technical documentation, no. of the document 0404.00.91-01.4 section 2.

2. Set-up

- During set-up apply directions of this manual
- Mount devices in a place without direct insolation
- Mounting and connecting could be carried out only without batteries
- Observe proper polarity when connecting batteries
- The device must be powered from the utility power grid with a protective earth terminal
- Check the quality of all done connections before switching the device on

2.1. Mounting

The power supply should be mounted in a carefully selected place, to minimize the risk of mechanical damages and not to exceed allowable ambient temperature and humidity. Power supplies of fire protection equipment should be mounted nearby this equipment to minimize voltage drop. If possible, the power supplies should be mounted in rooms separated as fire resistant areas (e.g. switchboard rooms, technical rooms, cable chutes)

The box should be mounted on the wall, using four holes in the rear side of the box. Before mounting, one has to open the box, unscrew three nuts fixing the chassis of the power supply to the rear face of the box and remove the power supply.

The empty box has to be fixed to the wall by 4 steel sleeves and screws. Wall plugs made of PVC can not be applied. If there is a need to lead wires between the box and wall one has to fix enclosed brackets to the box before mounting on the wall. Having the box fixed to the wall one has to mount the power supply back. .

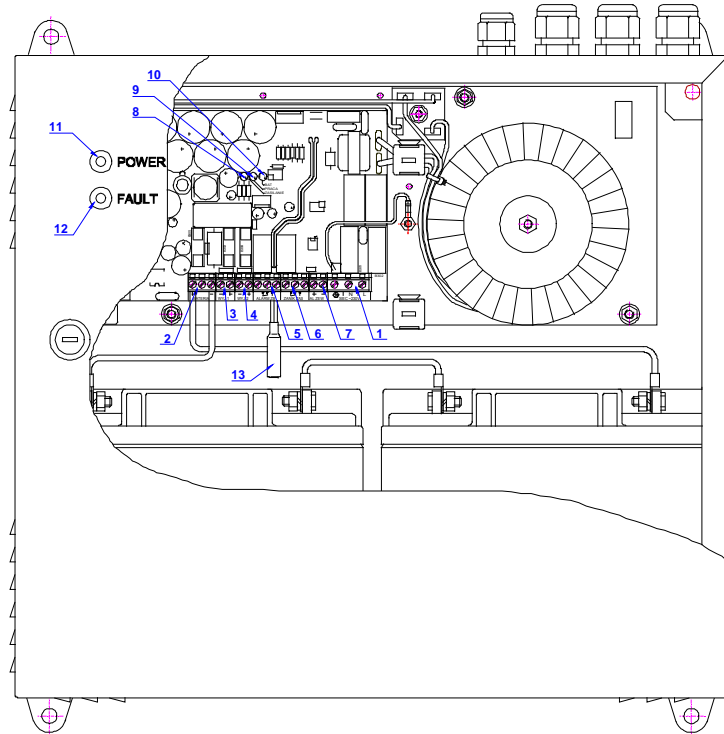
Location of the mounting holes is show in the section 1.2. Technical data.

2.2. Connections

One has to remember to connect the device to the permanent wiring using protective earth wire. It is recommended to outfit the installation with a surge protection system. The input voltage should not be cut off by the master fire protection switch.


The power supplies have no own mains power circuit breakers, so a dedicated, overcurrent and short circuit resistant breaker of at least 3A current is required in the powering installation (outside the power supply). The switchboard panel and breaker of the fire protection power supply should be clearly marked (by red color and number of the power supply or by a proper description). One breaker should protect one power supply. Using this breaker for other loads is impermissible.

The installation cables can enter the box from the top through three cable transits PG-11 and one PG-9 (dedicated for remote indication cables). All connections should be carried out according to the diagram inside the box (on the door). Holes of unused transits should be plugged by the plugs enclosed to the device.



View of the power supply ZSP135-DR.

Inside the box, in its upper part there is a chassis with all elements and modules of the power supply. Two maintenance-free batteries should be placed on the bottom of the box. Their capacity depends on the type of the power supply. Two LEDs for visual indication are located in the upper part of the door.

Description of elements of the power supply ZSP135-DR			
No.	Description	Label	Recommended type and cross-section of the wire
1	230V 50Hz mains power terminal	L, N and ground 	3-core multi stand cable *2) 0.75...1.5mm ²
2	Battery bank terminal	BATERIA (BATTERY)	*1)
3,4	Output terminals	WYJ 1, WYJ 2 (OUT 1, OUT 2)	twin core multi strand flame retardant halogen free *2) 1 or 2.5mm ²
5	Battery fault output	USZ BATERII (BAT FLT)	twin solid core telecom flame retardant *2) 1x2x0.8mm ²
6	Output of mains fault signal	USZ SIECI (MAINS FLT)	
7	Input of external fault signal	USZ ZEW (EXT FLT)	
8	Visual indication LED – green	ZASILANIE (MAINS)	
9	Visual indication LED – yellow	PRACA (OPERATION)	
10	Visual indication LED – red	BAT (BATTERY)	
11	Visual indication LED – green	POWER	
12	Visual indication LED – yellow	FAULT	
13	Temperature probe		

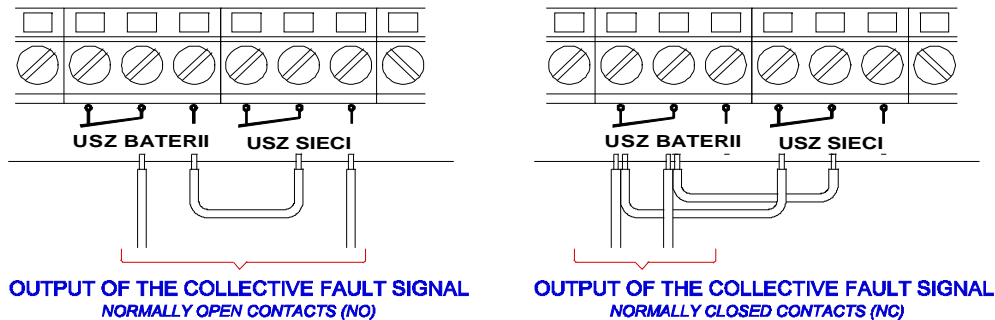
*1) The connection has to be done with wires delivered by the manufacturer. Pay due attention to the right polarity – look carefully at symbols next to the terminal.

*2) Selection of wires in power and control systems of fire protection equipment can be subject of local law and regulations, e.g. civil engineering code and derived ordinances.

Batteries are delivered in separate transport packages. They should be connected with wires delivered by the manufacturer. Before the connection the batteries have to be put on the bottom of the box. First, connect the batteries to the main circuit pack of the power supply, and then connect each with other. One has to pay due attention to the right polarity of the connection. In case of erroneous connection of the battery circuit a fuse shall blow.

2.3. Implementation of the collective fault indication

Relay outputs of faults **USZ SIECI** (MAINS FLT) and **USZ BATERII** (BATTERY FLT) can be used to implement the output of the collective fault indication. This will indicate on a single line occurrence of any event covered by both signals. Either NO or NC contacts of the relays can be used. Both options are shown on the picture below.



The visible pictograms representing the contacts of the relays refer to the state when the relays are not activated (voltage free state). By the fail safe rule this is the state indicating a fault.

3. Switching on for the first time

If all connections have been carried out correctly, then after having the power supply connected to the mains the indication LEDs **ZASILANIE** (MAINS), **PRACA** (OPERATION) (diodes 8 and 9 inside the box on the circuit pack – see the picture and table in the section 2.2) and **POWER** (the diode no. 11) should light up. Additionally, one should hear the sound of the relay attaching the battery bank to the system. The attaching of the battery happens only when the battery bank voltage is greater than 20.5V. During the switching on one should perform two checks.

3.1. Checking ability to back up output voltage.

Use a breaker in the electrical installation before the power supply ZSP135-DR to cut off the mains power. The power supply should switch to the battery mode, keeping voltage on its both outputs. Check it by whatever probe, e.g. a voltmeter or electric bulb.

This state is indicated by the blinking LED **POWER** in the door of the power supply. The relay **USZ SIECI** (MAINS FLT) shall switch to the inactive state (contacts connected as on the pictogram next to the terminal). The relay **USZ BATERII** (BATTERY FLT) shall remain activated. The state of a relay could be checked, e.g. by an ohmmeter connected to appropriate contacts of the relay.

3.2. Checking the battery circuit

When the power supply operates at presence of the mains power, break the battery circuit by disconnecting one of its wires. This state shall be detected during the first next test. It could last up to 10 minutes. Similarly, having the circuit connected again, the triggered fault indication shall be cleared automatically, but no sooner as after the first successful test – which may require another 10 minutes waiting.

This state should also trigger the indication **FAULT** in the door of the box and the indication **BAT** (the red LED) on the circuit pack of the power supply. The relay **USZ BATERII** (BATTERY FLT) shall switch to the inactive state (contacts connected as on the pictogram next to the terminal). The relay **USZ SIECI** (MAINS FLT) shall remain activated. The state of a relay could be checked, e.g. by an ohmmeter connected to appropriate contacts of the relay.

4. Operation

4.1. Introduction

Output voltages and state indication thresholds are factory preset. After having set up the power supplies require ongoing monitoring by the staff to react to fault indication which may occur during the operation.

4.2. Input of an external fault signal

The power supply can manage one binary external fault signal. To trigger this fault indication one has to shorten input contacts of the signal. The contact denoted by the sign “-“ is connected to the chassis (negative pole). The occurrence of the external fault is indicated by the blinking LED **FAULT** in the door of the box and by the non-activated relay. If any internal fault occurs at the same time, then the LED is on continuously. This event was assigned to the relay **USZ BATERII** (BATTERY FLT).

4.3. Device to indicate the opening of the door (option)

The power supplies ZSP135-DR optionally could be outfitted with the protection against unauthorized access to the box interior. Opening the door (after having it unlocked) causes disconnecting of the contacts of the sensor and triggers a fault indication – the blinking LED **FAULT** in the door of the box and the non-activated relay. The indication doesn't stop when the door is closed. This event was assigned to the relay **USZ BATERII** (BATTERY FLT). To clear the indication one has to press the contact of the sensor four times within the period not longer than three seconds. The LED **FAULT** returns then to the state before the door opening. The indication function is reactivated automatically after the door closing.

4.4. Indication of the state of operation




The power supplies ZSP135-DR have visual and remote indications of states. The indication continues until the cause of the trigger ceases.

The visual indication consists of two LEDs located in the door of the box; the green LED is labeled **POWER** and the yellow LED is labeled **FAULT**.


The remote indication consists of two sockets labeled **USZ SIECI** (MAINS FLT) and **USZ BATERII** (BATTERY FLT). All of them offer three dry contacts, totally isolated from other circuits.

Indication of the state of operation







State of the device	Visual indication		Relay indication	
	POWER green	FAULT yellow	USZ SIECI (MAINS FLT)	USZ BATERII (BATTERY FLT)
Disconnected from the mains and batteries	○	○	⏏ ⏏	⏏ ⏏
Mains operations	☀	○	⏏ ⏏	⏏ ⏏
Battery mode	☀	☀	⏏ ⏏	⏏ ⏏
A fault when mains power is present	☀	☀ or ☾	⏏ ⏏	⏏ ⏏
A fault during power failure	☾	☀ or ☾	⏏ ⏏	⏏ ⏏

-  - continuous light
 - no light
 - blinking

Attention.

The symbol of the relay shown in the tables above and below corresponds to the pictogram printed on the PCB next to the contacts of the relay. The shown state of the contacts  denotes an inactivated relay (voltage free state).

Indication of faults

yellow LED FAULT	relay USZ BATERII (BATTERY FLT)	Fault
		Mains power failure – including a failure of the converter
		Battery bank not present or voltage of the connected bank below 10V
		Low voltage (<24V) during battery test *1)
		High resistance (>250mΩ) of the battery circuit *1)
		Blown battery fuse
		Battery discharged (<21.6V) during battery mode
		Blown output fuse
		Open door *2)
		External fault
		Too low voltage (<20.5V) of the connected battery bank *3)







*1) This fault indication is cleared automatically after the first successful test of the battery circuit continuity and resistance measure.

*2) LED **FAULT** blinks cyclically.




*3) LED **FAULT** blinks with short flashes.

Additionally, inside the box on the circuit pack there are two LEDs – the green **ZASILANIE** (MAINS) and the yellow one **PRACA** (OPERATION) – to differentiate between power failure and a damage of the device, as well as a red one **BAT** – to indicate the state of the battery bank.

Indication of the state of mains power (LEDs on the circuit pack)

green LED ZASILANIE (MAINS)	yellow LED PRACA (OPERATION)	State of mains power
		Correct mains operation
		Damaged converter
		Mains power failure

Indication of the state of the battery bank (the LED on the circuit pack)

red LED BAT	State of the battery bank
	Battery OK
	Battery test failure
	High resistance of the battery circuit

4.5. Maintenance

The device doesn't require any special maintenance activities. During the normal operation one has to take care only to keep the necessary cleanness in the proximity of the box.

It must be taken into consideration that if battery expected life is e.g. 12 years at temperature of 20°C, then it is 10 years at temperature of 25°C and drops twofold when temperature increases further by 8°C.

Attention: CNBOP (a Polish notified body) and VdS recommend replacing batteries after 4 year of operation irrespectively of their state.

4.6. Inspections

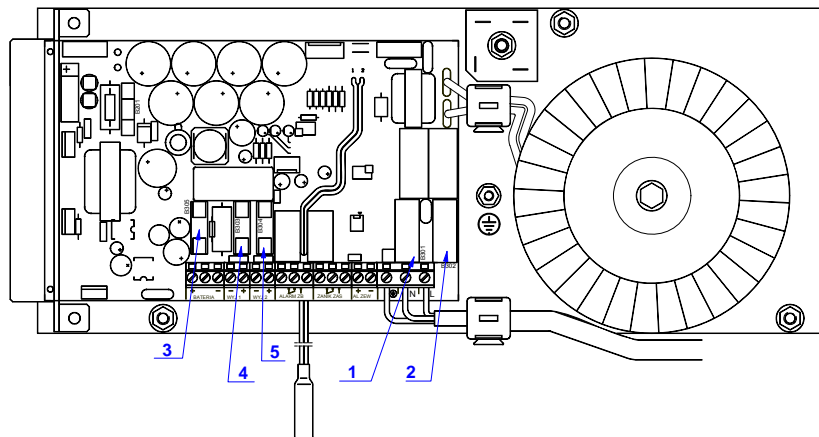
Frequency of inspections is regulated by provisions appropriate for the powered device, but shall not be lesser than once a year. During an inspection two functional tests described in section 3. Switching on for the first time should be carried out. Additionally, it should be checked if a fault indication triggered by the power supply is transmitted to the fire alarm control panel.

5. Repairs

5.1. Fuses

A user can replace only the fuses shown below.

		ZSP135-DR-2A ZSP135-DR-3A	ZSP135-DR-5A ZSP135-DR-7A
Battery circuit (quick-break F)	(3)	5A	10A
Output circuit (quick-break F)	(4) (5)	5A	10A
Mains input circuit (slow-blow T)	(1) (2)	3.15AT	3.15AT



Placement of fuses in the power supply ZSP135-DR

Additionally, there is a fuse B201 on the circuit pack of the power supply. Its damage indicates a serious failure of the device. The user must not replace it.

Guarantee and post-guarantee repairs are conducted by the staff of either the manufacturer or its authorized partner.

5.2. Diagnostics and correcting of malfunctions

Each case of triggering the visual indication **FAULT** – except mains power failure and the failure of the converter – is accompanied by the change of state of the relay **USZ BATERII** (BATTERY FLT).

Each case of mains power failure (including a damage of the converter of the power supply) triggers fault indication on the relay **USZ SIECI** (MAINS FLT).

To diagnose and correct a malfunction one can use the table below, paying attention to the visual indication of the state of the power supply.

Visual indication LEDs in a damaged power supply

Symptoms	Door		Circuit pack		Check
	POWER	FAULT	ZASILANIE (MAINS)	PRACA (OPERATION)	
No voltage on one of outputs					<ul style="list-style-type: none"> – output fuses (4,5) – electrical contacts on the right output terminal
No backup voltage on both outputs in case of a mains power failure (the second indication when there is mains power)					<ul style="list-style-type: none"> – battery fuse (3) – connections of the batteries
					<ul style="list-style-type: none"> – state of the batteries *1)
The device indicates a fault when the mains power is present and output voltages are correct					<ul style="list-style-type: none"> – quality of the connections of the batteries *2) – state of the batteries *2)
The device indicates the battery mode when the utility power is present					<ul style="list-style-type: none"> – mains power fuses (1,2) – state of the mains power
					<ul style="list-style-type: none"> – a serious malfunction – call the service
The device indicates a fault by the relay USZ BATERII (BATTERY FLT) during the battery mode					<ul style="list-style-type: none"> – the battery bank is nearly discharged (battery voltage below 21.6V). If the power failure continues the battery bank will be disconnected
The device indicates a fault by the blinking diode					<ul style="list-style-type: none"> – external fault – an unauthorized person has opened the door (optional indication)

*1) If the battery voltage is < 20.5V the battery bank shall not be connected to the system. Batteries should be charged by an external charger or replaced.

*2) The indication could have been triggered during the battery test – then red LED **BAT** on the circuit pack blinks, or because of high resistance of the battery circuit – the red LED **BAT** is on continuously (see the section 4.4). Having the batteries replaced or the connections corrected, the indication shall be cleared no sooner then after a correct run of the nearest test. It may last up to 10 minutes.

6. Remarks on the selection of the type of the power supply

Power supplies ZSP135-DR have various output currents and cooperate with internal batteries of various capacities. The selection of the specific type should depend on requirements of the specific load (powered devices).

First, one has to calculate the required battery capacity. To do this one has to take into account consumption of current during various states of operation of the powered devices as well as additional consumption for own needs during the mains power failure.

The minimal capacity of the battery bank can be defined with the help of the following formula:

$$Q_{BAT} = 1.25 \times [(I_{SB} + I_Q) \times T_{SB} + (I_{AL} + I_Q) \times T_{AL} + I_{ACT} \times T_3]$$

where:

Q_{BAT}	- battery capacity [Ah]
1.25	- safety coefficient to account for capacity loss after seasoning and wear-out
I_{SB}	- current employed by loads during the standby [A]
I_Q	- quiescent current [A]
T_{SB}	- required standby time [h] (4h, 30h or 72h)
I_{AL}	- current employed by loads during alarm [A]
T_{AL}	- alarm duration [h] (0.5h)
I_{ACT}	- current employed by actuators during an alarm [A]
T_3	- duration of three full work cycles of the actuator [h]

Attention: the power supply requires some minimal battery capacity during the standby and alarm for its own needs ($I_Q = 0.035A$). This is 3.3Ah for the standby of 72h, 1.4Ah for 30h, and 0.20Ah for 4h.

Having calculated from the above formula the required capacity of the battery bank, one can use the table in the section 1.1 to select the power supply, observing the constraint of the maximal capacity to mount in the given power supply and choosing the standard value which must be greater than the calculated minimal capacity.

Additionally, the following conditions must be met: $I_{SB} < I_{max.a}$, $I_{AL} < I_{max.b}$ and $I_{ACT} < I_{max.b}$.

7. Additional information

7.1. Manufacturer's remarks

The manufacturer reserves the right to introduce changes in the design and technology which shall not impair quality of the product.

7.2. Cooperating devices

7.2.1. Tester

A tester of power supplies ZSP135 has been developed for the service and maintenance staff. It allows reading values and states recognized by the controller of the power supply without intrusion into circuits of the power supply and without measurement equipment. It is also possible to determine the state of the battery bank during the test and to force a test outside the automatic schedule.

7.2.2. Communication module

The communication module ZSP135-MK is another optional outfit. It enables transition of data from the power supply via the RS232 or RS485 interface. The read data include measured values and states recognized by the controller of the power supply. The module was designed to be mounted inside the box of the



power supply. Owing to the module the power supply ZSP135-DR can be visible in the Building Management System GEMOS. The manufacturer offers integration with other systems.

More information on the cooperating devices shall be found in their separate user manuals.

7.3. Handling of the package and waste



The package of the product is made of materials which could be recycled. Unused packages should be handed over to a dust collector, after having them segregated.



The used out product constitutes non-hazardous waste, not to put into the general waste container. Instead, it should be handed over to the local collector of the waste electric and electronic equipment.

Professional handling of the waste electric and electronic equipment (WEEE) shall limit negative effects of improper storage and processing of this waste on human health and environment.

The used out batteries should be handled according to local regulations, e.g. introduced as the implementation of the Battery Directive (Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006). They are sealed, maintenance-free, valve-regulated (equipped with a pressure relief valve) lead acid batteries. When used out they constitute hazardous waste, coded in the European Waste Catalogue as 16 06 01*.